ATTACHMENT 2

JOINT FAA/INDUSTRY NOISE WORKING GROUP

RECOMMENDATIONS

BROAD OBJECTIVES: Before formulating recommendations, the working group reviewed the objectives on which the recommendations would be based. These objectives are summarized as follows:

1. To enhance safety of flight operations while providing noise relief:

a. To enhance safety through standardization by establishing national noise abatement procedures. To achieve this objective it is necessary to prohibit proliferation of numerous nonstandard noise abatement procedures tailored for unique airport/community environments.

b. To establish noise abatement procedures that limit the number of takeoff profiles that the flightcrew must be trained to perform.

c. To establish minimum operational criteria (a floor) and make these criteria mandatory, through Operations Specifications.

d. To discourage noise measurements from being used as a means for controlling airport access which has caused operators and pilots to use unique and questionable procedures to remain competitive.

2. To provide effective noise relief in an equitable manner:

a. To provide maximum noise relief to communities in a manner that is consistent with safe operating practices and that are acceptable to the aviation industry as a whole.

b. To discourage the use of locally developed noise measurement programs which induce operators to service those communities with available Stage III aircraft, which inturn results in increased use of the noisier Stage II aircraft at other communities.

Working Group Recommendation on the Number of Acceptable Noise Abatement Procedures: Conceivebly an infinite number of noise abatement procedures could be devised and rationalized because of the following factors:

1. The range of differences in operational performance and noise characteristics between aircraft types and the variety of takeoff configurations within aircraft types.

2. The range of takeoff weights dictated by flight leg length.

3. The wide range of ambient temperatures expereinced in nationwide operations.

4. The many different community and airport physical layouts with unique environmental situations and the wide range of runway lengths.

The working group considered these factors during their initial efforts to develop a flexible set of criteria which would provide both optimal noise relief and safe flight operations. In addition, the group believes there have been recent and dramatic changes within the industry that must be taken into account in the development of standard noise abatement procedures. These changes include the rapid growth of some air carriers; mergers of aircraft fleets, flightcrews, and operational procedures of other air carriers; and new procedures and systems designed to improve airport and airspace capacity. Other factors that were considered include the following:

1. The rapid influx of new technology aircraft and flight guidance and control systems has resulted in different procedures and flightcrew workload requirements for each aircraft type. To also have significantly different noise abatement procedures for each aircraft type in a fleet, complicates the standardization of flight crew training, increases the difficulty in overcoming ingrained human habit patterns, and adversely affects retention of flightcrew proficiency.

2. Many air carriers experience either continual or periodic turnovers of flightcrew member from one aircraft type to another and/or from one flightcrew position to another. This often results in flightcrews having a low

flight time experience in a particular aircraft type and/or flightcrew member position. To provide for different noise abatement procedures between aircraft types or different procedures for different airports exacerbates the problems associated with low flight time experience and appropriate crew pairing.

Because of these factors, the working group recommends that minimum criteria should be established which would permit no more than two basic types of noise abatement procedures. These procedures would be applicable to all types of turbojet aircraft over 75,000 pounds. The basic types of noise abatement procedures recommended are the "close-in" and the "distant" procedures (see recommendations for minimum criteria for noise abatement procedures).

WORKING GROUP RECOMMENDATION ON INITIATING ALTITUDE: For the purpose of this discussion the "initiating altitude" is the altitude in the initial climb after takeoff in which the first action is taken to initiate a thrust cutback or to initiate flap retraction with a subsequent thrust cutback for the purpose of noise reduction.

During the takeoff maneuver, the dynamics of rapidly changing events such as rotation, establishment of initial pitch attitude, gear retraction, airspeed control, and other configuration changes, make the initial segment of the takeoff maneuver a critical phase of flight. During this segment there are high flightcrew workload requirements which include stabilization of the flight path as well as traffic vigilance, situational orientation, instrument scan, and awareness of aircraft performance. To encompass the spectrum of aircraft types, takeoff weights, configurations, and to provide for reasonable flightcrew workloads, a minimum altitude should be specified for initiating other actions for the purpose of noise abatement which compound flightcrew workloads. The working group believes that a minimum altitude of 800 feet would provide reasonable assurance that most aircraft types and flight crews can achieve a stable flight profile under relatively normal workload levels before initiating a thrust cutback or flap retraction. The group also recommends that 800 feet should be established as the minimum initiating altitude for the following additional reasons:

1. A predominant and well established safety factor is the altitude gained immediately after liftoff. Altitude equates to time, airspeed, obstacle clearance, reduced flightcrew workload and concentration inside the cockpit, and usually increased external visibility.

2. The effects of windshear and wingtip vortex encounters are less critical at altitudes above 800 feet.

3. Achievement of flight path stability at altitudes below 800 feet enhances the flightcrew ability to exercise external vigilance.

4. Power and configuration changes and mode switching initiated below 800 feet increase exposure to system failures and the associated risks, earlier and at lower altitudes. This is especially true when such failures are induced by power changes, configuration changes and mode switching. Minimizing the failure risk while the flightcrew is establishing stabilized flight is more acceptable. In most cases the aircraft flight path will be stabilized by 800 feet.

5. The level of 800 to 1,000 feet AFE is generally accepted by the air carrier industry as the standard clean up altitude for obstacle clearance purposes at most airports. Using a minimum of 800 feet, rather than a lower altitude, minimizes the need for changing the initiating altitude for obstacle clearance purposes at other airports.

6. The level of 800 to 1,000 feet AFE permits time for the flightcrew to initiate navigation tasks before performing power and configuration changes.

7. The altitude of 800 to 1,000 feet closely represents the altitude used within industry for normal operating procedures, thereby avoiding a requirement for special training.

8. The full operational capability of TCAS is not available below 1,000 feet. With the establishment of the 800 foot minimum thrust cutback criteria, full TCAS capability is available sooner and closer to the airport.

WORKING GROUP RECOMMENDATION ON AMOUNT OF THRUST REDUCTION:

Any thrust cutback after the aircraft has been established on a stablized flight path requires at least some flightcrew action to restablize the flight path. The greater the cutback, the greater the flightcrew workload required to stablize pitch attitude, airspeed, and thrust setting. The amount of flight path destabilization caused by a thrust cutback can vary significantly depending on flight conditions such as takeoff weight, ambient temperatures, and density altitudes. For example, a thrust cutback for noise abatement purposes when the aircraft is at a low gross weight in a cold temperature causes a much greater workload (sometimes unexpected) than when the aircraft is at a higher weight in a warmer temperature. The flightcrew workload can also be increased and compounded at anytime by external influences such as navigation, ATC, and outside traffic viglance requirements, and weather related conditions including turbulence, ragged or intermediate cloudiness, temperature inversions, windshear, precipitation, icing, etc.

In addition if standard close-in and distant noise abatement procedures involving deep thrust cutbacks are adopted, their use will become more frequent at many different airport/runway environments throughout the nation and at foreign locations. Because of the effect that a thrust cutback has on flightcrew workload and the chances that this effect may be more frequently compounded by external influences due to the increased usage of such procedures, the working group believes that a minimum criterion must be established for the amount of thrust that can be cutback. This minimum criteria must assure manageable workloads for the average flightcrew experience and capabilities without extraordinary training requirements.

The working group also believes that a minimum criterion for the amount of thrust cutback must be established to ensure that sufficient performance margins and reserves are available throughout the noise abatement procedure. This minimum criteria must account for factors which degrade aircraft performance under normal flight conditions such as bank angles up to 30 degrees, windshear, temperature inversions, and less than scheduled engine power. The minimum criteria must also account for degraded aircraft performance resulting from emergencies such as an engine failure.

The working group believes and recommends that the following minimum criteria should be established for the amount of thrust reduction permitted for noise abatement procedures.

1. Without Automatic Thrust Restoration Systems: The amount of thrust reduction must not be less than the thrust necessary, in the event of an engine failure, to maintain the takeoff path engine-inoperative climb gradients specified by FAR 25.111(c)(3). This minimum thrust setting must be determined without considering the subsequent addition of thrust on the remaining engine(s) from a pilot action.

2. With Authomatic Thrust Restoration Systems: The amount of thrust reduction must not be less than the thrust necessary, in the event of an engine failure, to maintain a takeoff path engine-inoperative climb gradient of not less than 0%. This minimum thrust setting must be determined without considering the subsequent addition of thrust on the remaining engine(s) from an automatic thrust restoration system. In addition it must be shown that it is improbable that the thrust restoration system will fail to restore at least sufficient thrust to maintain the engine-inoperative gradients specified by FAR 25.111(c)(3) without any pilot intervention.

WORKING GROUP RECOMMENDATIONS ON MINIMUM CRITERIA FOR NOISE ABATEMENT PROCEDURES: The following minimum criteria are recommended for the close-in and distant takeoff noise abatement procedures:

A. CLOSE-IN NOISE ABATEMENT PROCEDURE (MINIMUM CRITERIA):

1. An initiating altitude of not less than 800 feet AFE must be used.

2a. For aircraft without automatic thrust restoration systems installed, cutback thrust reduction shall be less than the thrust necessary to maintain the takeoff path engine - inoperative climb gradients specified in FAR 25.111(c)(3). If manual thrust reductions are used, the thrust shall be reduced at a normal rate.

2b. For aircraft with automatic thrust restoration systems installed, cutback thrust reduction shall not be be less than that necessary to maintain a takeoff path engine-inoperative climb gradient of not less than 0%. The rate of thrust reduction shall be at a normal rate.

3. Maintain at least Vzp to not less than 3,000 feet above field elevation or until past the noise sensitive area.

NOTE: Vzp = Minimum maneuvering speed for configuration.

4. Resume normal procedures.

B. DISTANT NOISE ABATEMENT PROCEDURE (MINIMUM CRITERIA):

1. An initiating altitude of not less than 800 feet must be used.

2. Retract flaps/slats while accelerating on individual aircraft schedule.

3a. For aircraft <u>without</u> automatic thrust restoration systems installed, after flap retraction or at a partial flap setting, if appropriate, set cutback thrust. Cutback thrust reduction shall not be less than that necessary to maintain the takeoff path engine inoperative climb gradients specified in FAR 25.111(c)(3). If manual thrust reductions are used, the thrust shall be reduced at a normal rate.

3b. For aircraft <u>with</u> automatic thrust restoration systems installed, after flap retraction or at a partial flap setting, if appropriate, initiate cutback thrust. Cutback thrust reduction shall not be less than that necessary to maintain a takeoff path engine-inoperative climb gradient of not less than 0%. The rate of thrust reduction shall be at a normal rate.

4. Maintain at least Vzp to not less than 3,000 feet above field elevation or until past the noise sensitive area.

NOTE: Vzp = Minimum maneuvering speed for configuration.

5. Resume normal procedures.

NOTES

1. Operators may, at their discretion, develop and use a normal takeoff procedure when community noise considerations are not a factor. The operator may not develop a normal procedure that prescribes a power or configuration change before attaining 800 feet AFE.

2. The standard noise abatement profiles do not apply when it could be construed to affect the responsibilities and authority of the pilot in command for the safe operation of the airplane under FAR 91.3 or other regulations.

3. Intermediate flap changes before the noise abatement initiating altitude are permitted when appropriate for climb performance.

4. Cutback thrust for airplanes with slow flap retraction rates may be set at an intermediate flap setting.